



Application Report

DOC (UV Absorption) in Raw Water

The water available at the inflow of a Water Treatment Plant originates from different sources: ground water, rivers, lakes, wells. Accordingly, this water can be contaminated in different ways. Solid particles, dissolved organic carbons, humic acids, germs or micro pollutants can occur in any combination. Numerous dissolved organic carbons absorb ultraviolet light.

Whilst the solids can often be seen by the naked eye (turbidity), dissolved organic carbons and other harmful substances can not be seen.

Benefits

The UV absorption is a sum parameter which can be easily determined and which allows a statement on the contamination of the waters with dissolved organic carbons. One often also refers to DOC (Dissolved Organic Carbon).

In each individual plant, the correlation between UV absorption and DOC can be determined and the instrument correspondingly programmed. For this the customer's cooperation and their laboratory is necessary.

Typical application

Water is fed into the water treatment plant through a channel or a pipe. With a pump or with hydrostatic pressure, a sample is fed to the measuring instrument.

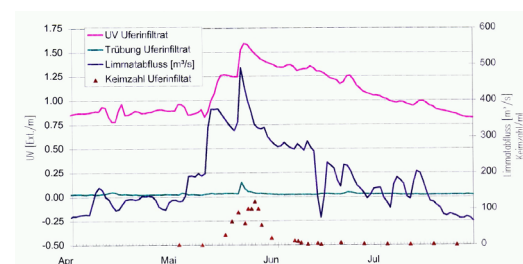
Depending on the origin of the water, the season and the current weather conditions, the water sample will contain more or less solids (turbidity). This can be lower than 1 FNU to several hundred FNU. The sample therefore has to be filtered in most cases. SIGRIST offers such a filter unit in their portfolio, consisting of a coarse filter of 20 μ m and a fine filter of 0.5 μ m.

In addition to the solid particles, the water can contain dissolved organic carbons, which can not be filtered. This organic load is measured with UV absorption and shown in E/m. Typical values are 0 to a few E/m. Depending on the requirements of the individual countries a respective reaction is necessary. The SIGRIST instrument can measure up to 30 E/m (with the 100mm PVC cell) and up to 60 E/m (with the 50mm PVC cell).



Pict. 1: ColorPlus Bypass with 100mm PVC measuring cell

Practical UV absorption measurement



Pict. 2: Measurements in the runoff of Lake Zurich (Limmat)

The graph shows the reaction of the UV absorption in E/m (pink, left scale), the amount of runoff water in m³/s (blue, right scale), turbidity (green) and the bacterial count (small triangles).

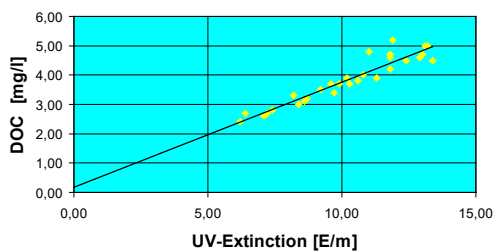
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DOC [UV Absorption] in Raw Water

The UV absorption normally lies here below 1 E/m. With the increasing amount of water, the amount of organic carbon and the bacterial count also increased.

In this application, a limit can be determined at e.g. 1.1 E/m, at which the instrument initiates an alarm if it is exceeded. Thus the instrument indicates that an increased amount of dissolved organic carbon is contained in the water.

Correlation UV absorption (E/m) – DOC (mg/l)



Pict. 3: Correlation UV absorption - DOC

Basically the ColorPlus 3 is adjusted to E/m. The user has the option to collect samples with different values of E/m. For each of these samples a laboratory has to define the DOC content in mg/l. The values of E/m and mg/l for all the samples taken can be entered into the ColorPlus 3 software. With this information a curve will be extrapolated, the more values the more precise the curve! The ColorPlus 3 then is subsequently parametrized (offset and scale factor) and converted to show the results in mg/l DOC.

Cost-benefit analysis

With this measurement, the water treatment company has a cost-advantageous online monitoring system of raw water. If an alarm is given, a laboratory measurement is initialized and, depending on the intensity of the contamination, the water can be channelled into the reject. The online measurement results in process reliability and the number of samples which have to be analysed in the laboratory is reduced to a minimum.



Pict. 4: ColorPlus Bypass in raw water with filtration of sample

SIGRIST product and configuration for this application:

- Water instrument 254nm/50mm, 100mm: ColorPlus 3
- SICON control unit
- Optional: waterfilter unit FEW4 with filter cartridges
- Alternative: individual configuration, Basic instrument 1 UV bypass: ColorPlus 2, measuring cell, light source(s)

Parameter settings

- Adjust water flow
- Determine limits for pre-alarm and alarm with the customer

Advantages of SIGRIST ColorPlus 3 bypass

Customer benefits

- Internal compensation of window soiling
- permanently precise measuring values
- Little maintenance effort: The instrument causes an alarm as soon as the measuring cell needs to be cleaned
- no fixed maintenance cycle is necessary
- Simple cleaning of the measuring cell
- low maintenance cost
- Control of device exclusively with distilled water and checking unit
- no chemicals are necessary
- Very high sensitivity
- low detection limits
- Influence of turbidity can be compensated with a 2nd pathlength
- values measured are more precise
- Optionally, the measurement of colour in Hazen (also called Pt-Co) can be integrated at low costs

 **SIGRIST**
PROCESS-PHOTOMETER

SIGRIST-PHOTOMETER AG
Hofurlistrasse 1 · CH-6373 Ennetbürgen
Tel. +41 41 624 54 54 · Fax +41 41 624 54 55
www.photometer.com · info@photometer.com